A petri dish is not a primary source, or is it?

Opportunities for school, public, and academic libraries

Megan Carlton, MLIS
Science Librarian, UNC-Greensboro

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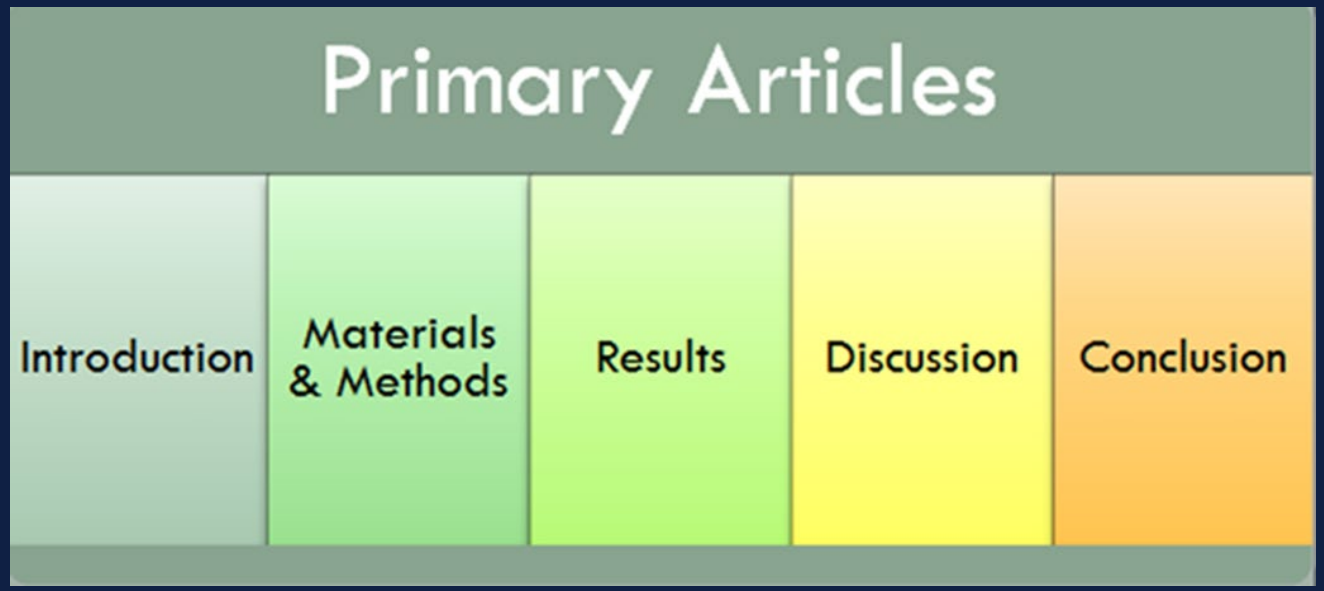
Agenda

- Primary and secondary sources in the sciences
- Data
- Collecting primary data
- Using secondary data

What is Primary Literature?

A document reporting **new and original research** or findings written **by the original researcher**.



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3. Results

3.1. Abundance and richness of understory plants

Knotweed stem density ranged from 0.0 to 8.8 stems m^{-2} (mean of 3.1 stems m^{-2}) among transects (Table 1). Multiple regression models yielded significant negative relationships be-

2. Methods

2.1. Study species

Giant knotweed (*P. sachalinense* F. Schmidt ex Maxim) is one of three closely related congeners that include Japanese knotweed

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Community and ecosystem consequences of giant knotweed (*Polygonum sachalinense*) invasion into riparian forests of western Washington, USA

Lauren S. Urgenson [a,b,*], Sarah H. Reichard [b], Charles B. Halpern [a]

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ARTICLE INFO

Article history:
Received 29 October 2008
Received in revised form 11 February 2009
Accepted 17 February 2009
Available online 28 March 2009

ABSTRACT

The invasive, non-native herb, giant knotweed (*Polygonum sachalinense*), is becomin
mon in riparian corridors throughout North America and Europe. Despite its prevale
limited study of its ecological impacts. We investigated the effects of knotweed inv
dance and diversity of forest understory plants, and the quantity and nutrient quality
in riparian forests in western Washington, USA. Among 39 sampling locations, knot

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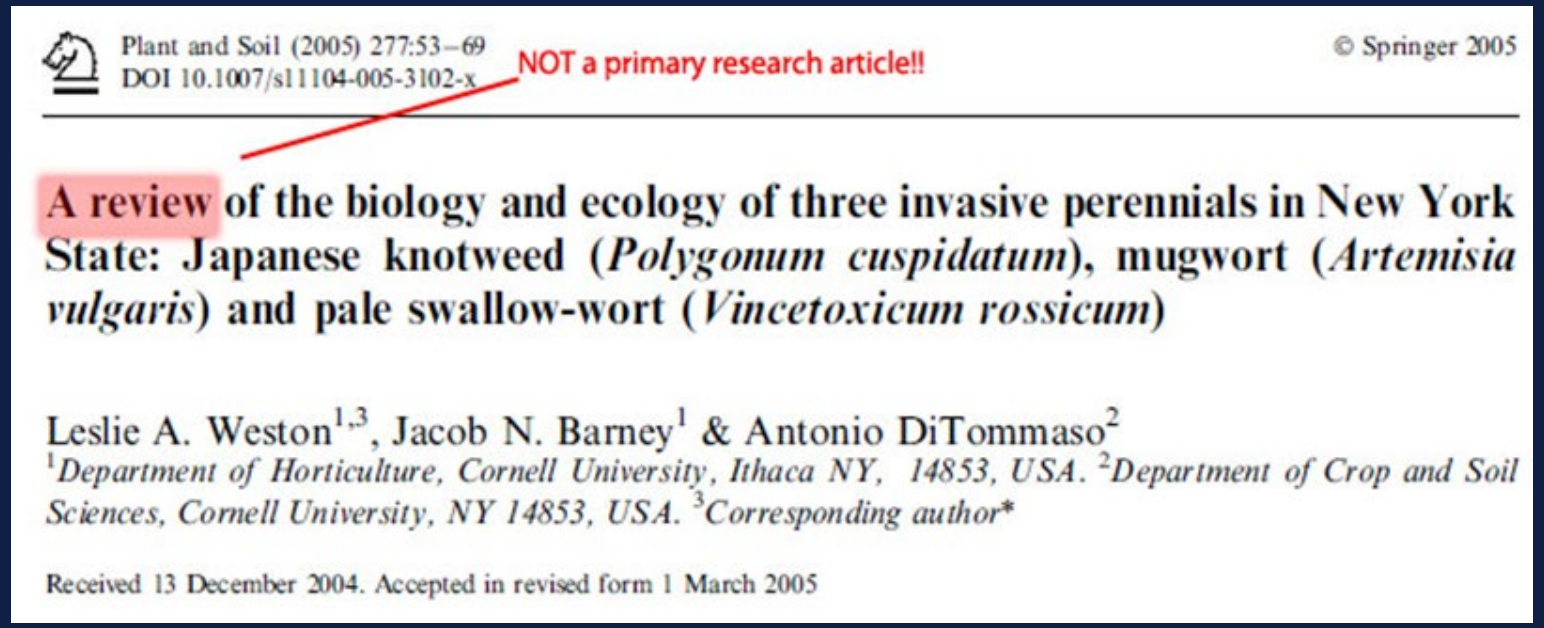
What is Secondary Literature?

Publications about primary sources that discuss, abstract, index or evaluate the publication; written by someone other than the original researcher.



Plant and Soil (2005) 277:53–69
DOI 10.1007/s11104-005-3102-x

NOT a primary research article!!

© Springer 2005

A review of the biology and ecology of three invasive perennials in New York State: Japanese knotweed (*Polygonum cuspidatum*), mugwort (*Artemisia vulgaris*) and pale swallow-wort (*Vincetoxicum rossicum*)

Leslie A. Weston[1,3], Jacob N. Barney[1] & Antonio DiTommaso[2]
[1]*Department of Horticulture, Cornell University, Ithaca NY, 14853, USA.* [2]*Department of Crop and Soil Sciences, Cornell University, NY 14853, USA.* [3]*Corresponding author**

Received 13 December 2004. Accepted in revised form 1 March 2005

10 **Adaptive evolution in invasive species** Review Article — NOT a primary research article.
Trends in Plant Science, Volume 13, Issue 6, June 2008, Pages 288-294
Peter J. Prentis, John R.U. Wilson, Eleanor E. Dormontt, David M. Richardson, Andrew J. Lowe
Show preview | PDF (391 K) | Related articles | Related reference work articles

11 **Natural products in crop protection** Original Research Article — A primary research article.
Bioorganic & Medicinal Chemistry, Volume 17, Issue 12, 15 June 2009, Pages 4022-4034
Franck E. Dayan, Charles L. Cantrell, Stephen O. Duke
Show preview | PDF (420 K) | Related articles | Related reference work articles

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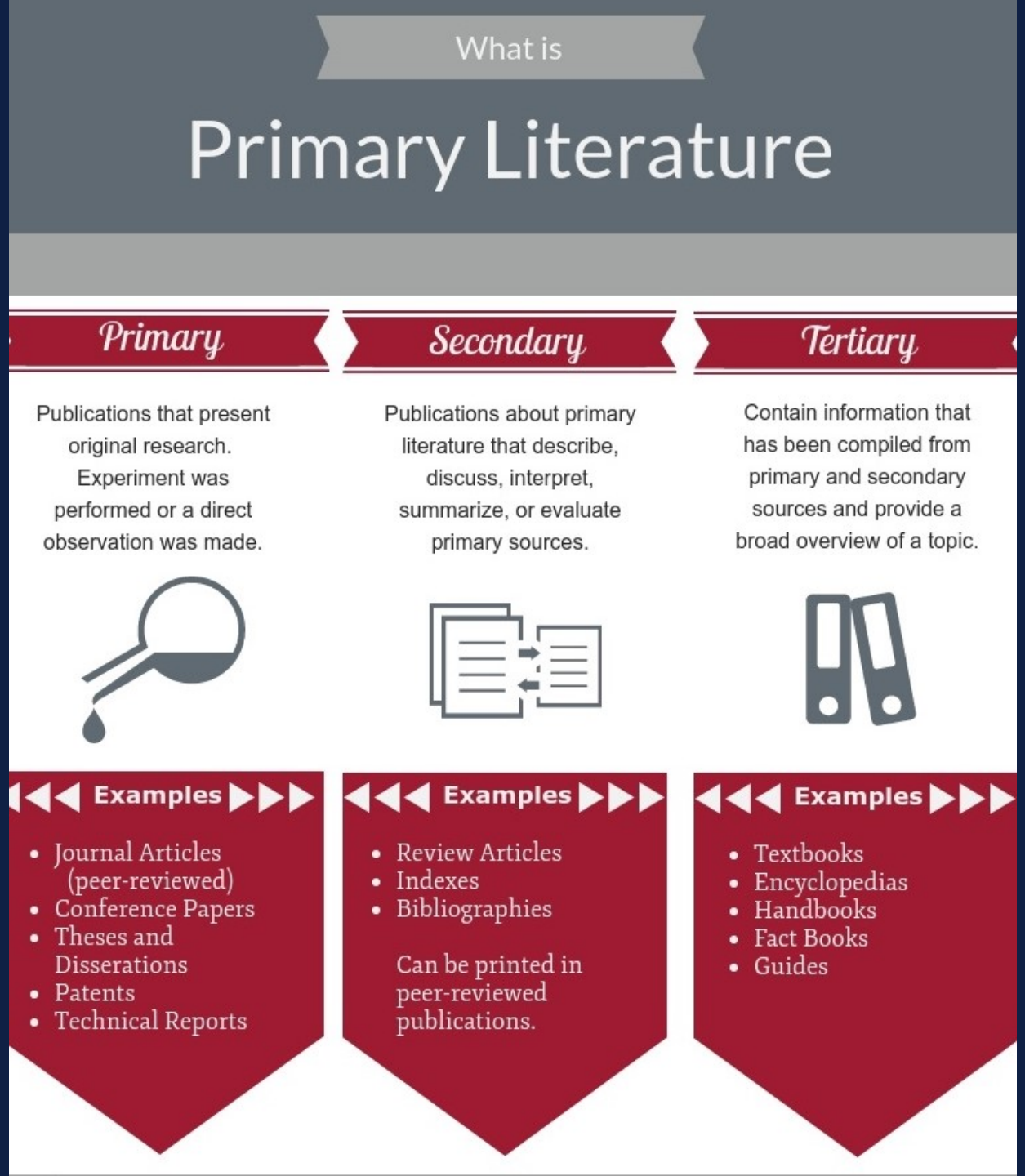
Let's test what we've learned!

go.uncg.edu/primaryorsecondary



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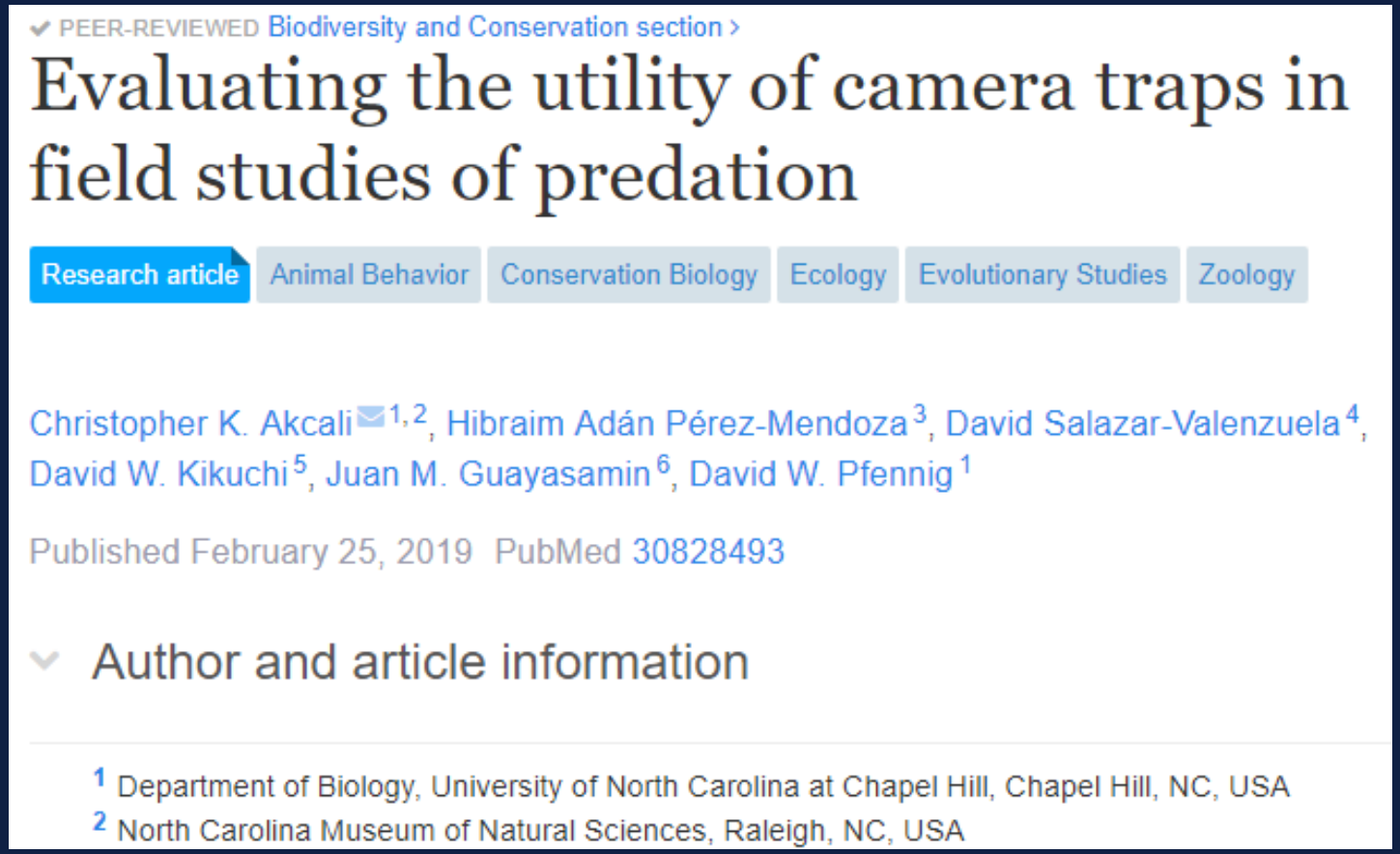
Primary or Secondary



✔ PEER-REVIEWED Biodiversity and Conservation section ›

Evaluating the utility of camera traps in field studies of predation

Research article | Animal Behavior | Conservation Biology | Ecology | Evolutionary Studies | Zoology

Christopher K. Akcali [1,2], Hibraim Adán Pérez-Mendoza [3], David Salazar-Valenzuela [4], David W. Kikuchi [5], Juan M. Guayasamin [6], David W. Pfennig [1]

Published February 25, 2019 PubMed 30828493

Author and article information

[1] Department of Biology, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA
[2] North Carolina Museum of Natural Sciences, Raleigh, NC, USA

Primary or Secondary

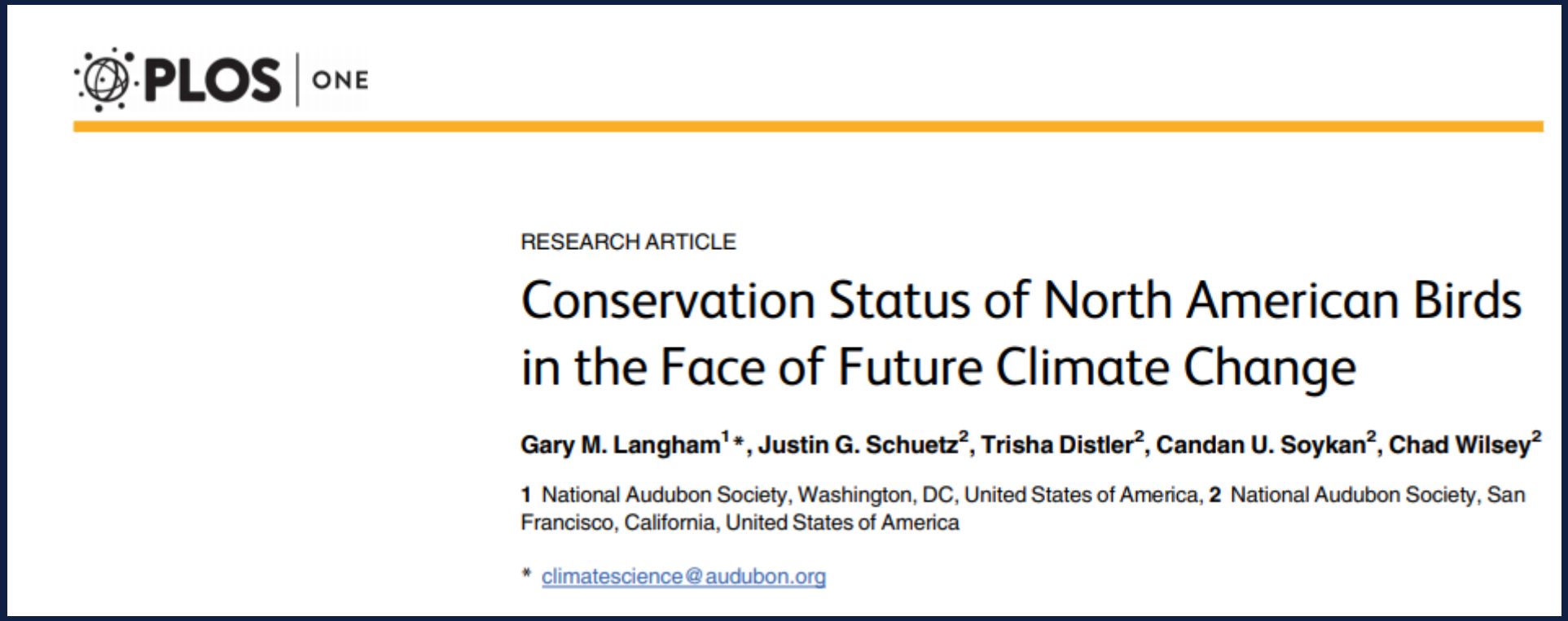
Species composition and geographic distribution of invertebrates in fouling communities along the east coast of the USA: a regional perspective

Ronald H. Karlson[1,3,*], Richard W. Osman[2]

[1]Department of Biological Sciences, University of Delaware, Newark, Delaware 19716, USA
[2]Smithsonian Environmental Research Center, PO Box 28, 647 Contees Wharf Road, Edgewater, Maryland 21037, USA

[3]*Present address:* 266 Carters Mill Road, Elkton, Maryland 21921, USA

Primary or Secondary



PLOS ONE

RESEARCH ARTICLE

Conservation Status of North American Birds in the Face of Future Climate Change

Gary M. Langham[1]*, Justin G. Schuetz[2], Trisha Distler[2], Candan U. Soykan[2], Chad Wilsey[2]

1 National Audubon Society, Washington, DC, United States of America, **2** National Audubon Society, San Francisco, California, United States of America

* climatescience@audubon.org

Primary or Secondary

The Ozone Component of Global Change: Potential Effects on Agricultural and Horticultural Plant Yield, Product Quality and Interactions with Invasive Species

Fitzgerald Booker[1*], Russell Muntifering[2], Margaret McGrath[3], Kent Burkey[1], Dennis Decoteau[4], Edwin Fiscus[1], William Manning[5], Sagar Krupa[6], Arthur Chappelka[7] and David Grantz[8]

([1]*United States Department of Agriculture-Agricultural Research Service, Plant Science Research Unit, and Department of Crop Science, North Carolina State University*, Raleigh, North Carolina 27695, USA;

[2]*Department of Animal Sciences, Auburn University*, Auburn, Alabama 36849, USA;

[3]*Department of Plant Pathology and Plant-Microbe Biology, Long Island Horticultural Research Extension Center, Cornell University*, Riverhead, New York 11901, USA;

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What about Data?

Primary Data

Collected by a researcher from first-hand sources

- Surveys
- Observations
- Interviews
- Experiments

Secondary Data

Gathered from studies, surveys, or experiments that have been run by other people -or- for other research.

Why use data?

- To prepare students to address real world complex problems;
- To develop students' ability to use scientific methods;
- To prepare students to critically evaluate the validity of data or evidence and of their consequent interpretations or conclusions;
- To teach quantitative skills, technical methods, and scientific concepts;
- To increase verbal, written, and graphical communication skills; and
- To train students in the values and ethics of working with data.

C. A. Manduca and D. W. Mogk, Using data in undergraduate science classrooms, NSDL, 2002

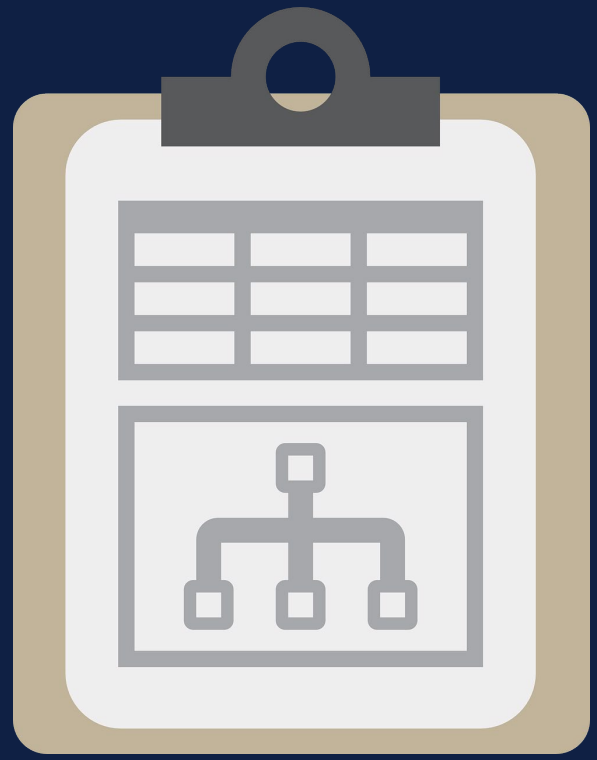
What data should you use?

NC Environmental Literacy Plan

- “Provide field experiences as part of the regular school curriculum…”

NC standards correlations available in:

- Project WILD
- Project WET
- Project Learning Tree



What data should you use?

The kind of data that is valuable in the classroom setting depends directly on the learning goals and content of the course.

Image by E Swamy from Pixabay

Collecting Primary Data

- Provides an opportunity for students to directly participate as scientists.
- Students experience the scientific process first hand.
- Learn technology skills for collecting data.

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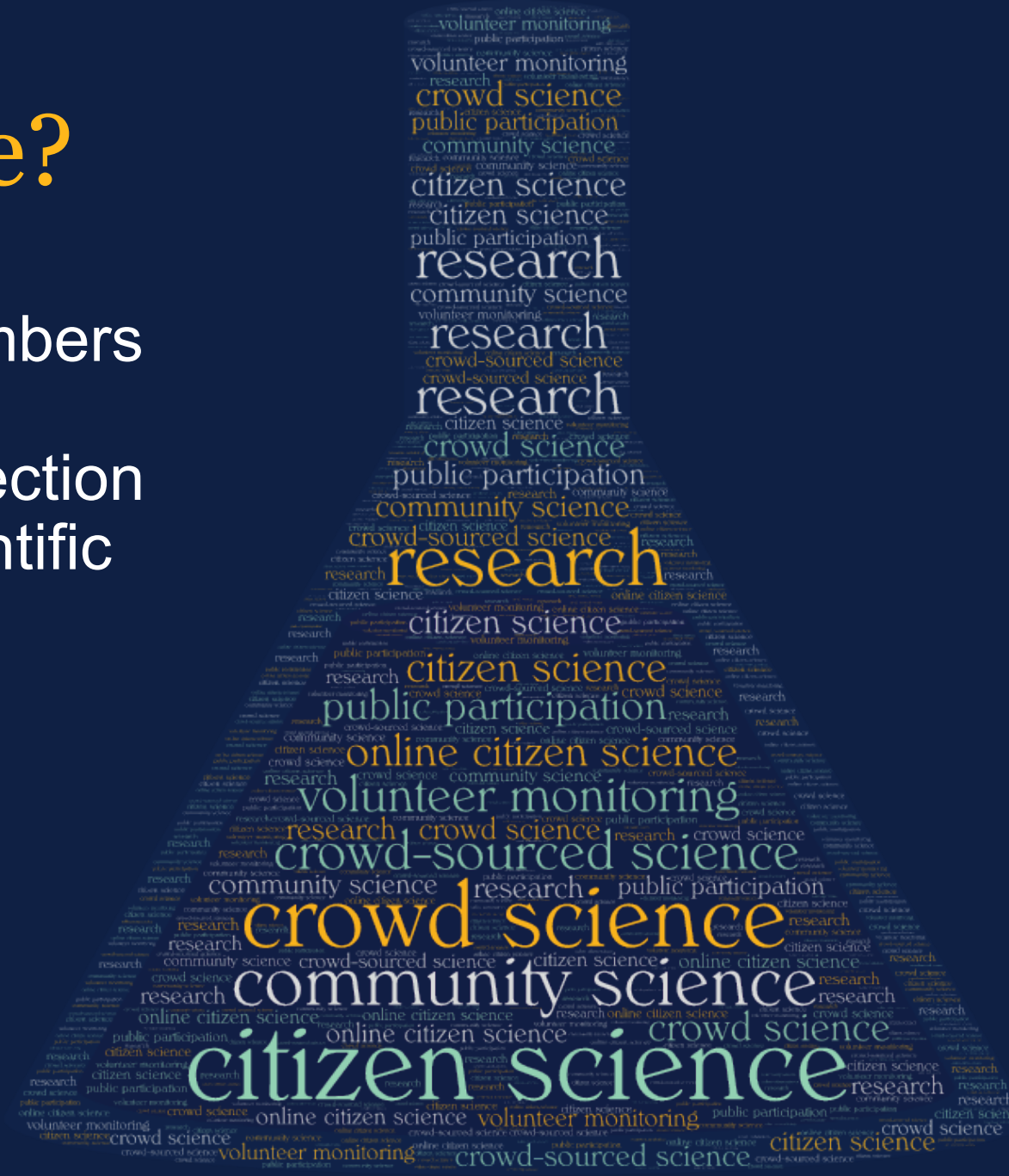
What is citizen science?

Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions (Oxford English Dictionary).

Public participation in scientific research



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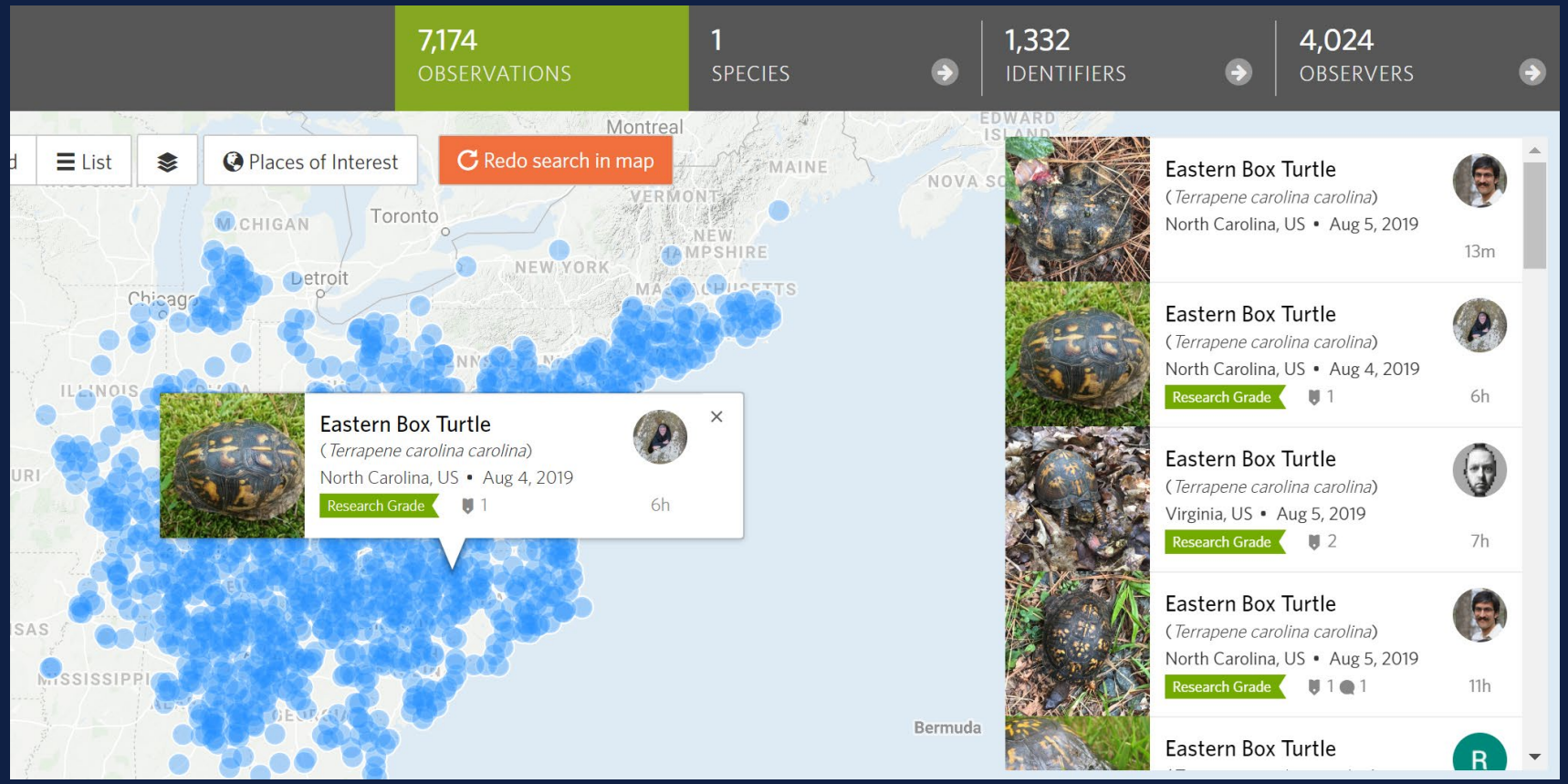
Projects are excellent for developing science-related skills:

- Identifying organisms
- Using measurement instruments
- Collecting field data
- Following protocols
- Process of research
- How scientific questions are asked and answered

Image by Reza Septian from Pixabay

iNaturalist



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PHENOLOGY AT PLAY

Perform skits and graph data to understand effects of climate change on bird population.

Student Pages

Phenology Data Sheet #1
Phenology Data Sheet #2
Phenology Graph #1
Phenology Graph #2
Phenology at Play Script

Additional Resources

Effective Climate Change Education (Appendix)
National Audubon Society's Geographical Search on Climate Impacts (animated map of shifting ranges of bird specie

In Step with STEM Resources

Make a Rain Guage https://www.theecologycenter.org/resources/build-a-rain-gauge/

Percipitation Data National Weather Service https://www.weather.gov/marfc/DailyPrecipitation

Citizen Science Programs

iNaturalist https://www.inaturalist.org/

Preserving Biodiversity: Threats and Solutions

High School Science » Unit: Biodiversity

Big Idea: Human activity threatens our cohabitant species on Earth. Balancing the needs of humans with the needs of other species will require creativity and cooperation on multiple fronts.

Standards

SL.11-12.1 SL.11-12.1a SL.11-12.1b +5 more

14 RESOURCES 3 FAVORITES

Biodiversity Survey part 1: Community Mapping and introduction to iNaturalist

High School Science » Unit: Biodiversity

Big Idea: If we're going to use technology to do a project, there is some necessary preparation to set up and get familiarized with the specific tools we'll be using.

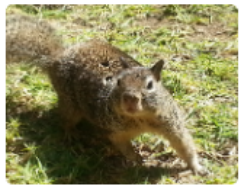
Standards

HSN-Q.A.3 W.11-12.6 W.11-12.7 +1 more

17 RESOURCES 6 FAVORITES

Biodiversity Survey part 2: Observing and Identifying Local Species

High School Science » Unit: Biodiversity



Big Idea: Knowing what you don't know is an important first step in an inquiry-based project.

Standards

W.11-12.6 W.11-12.7

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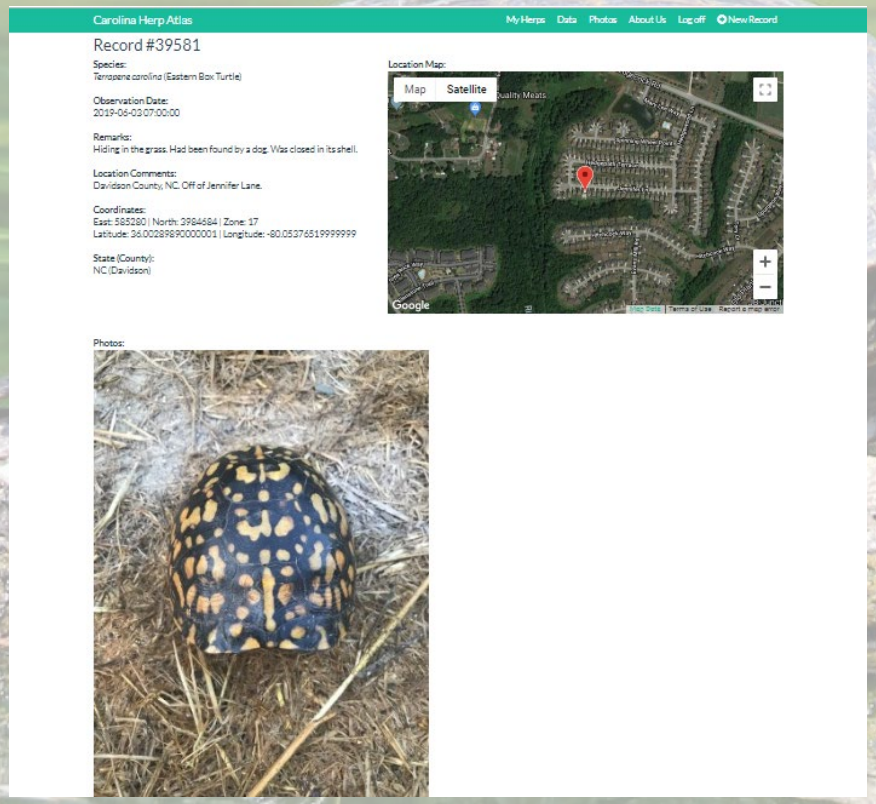
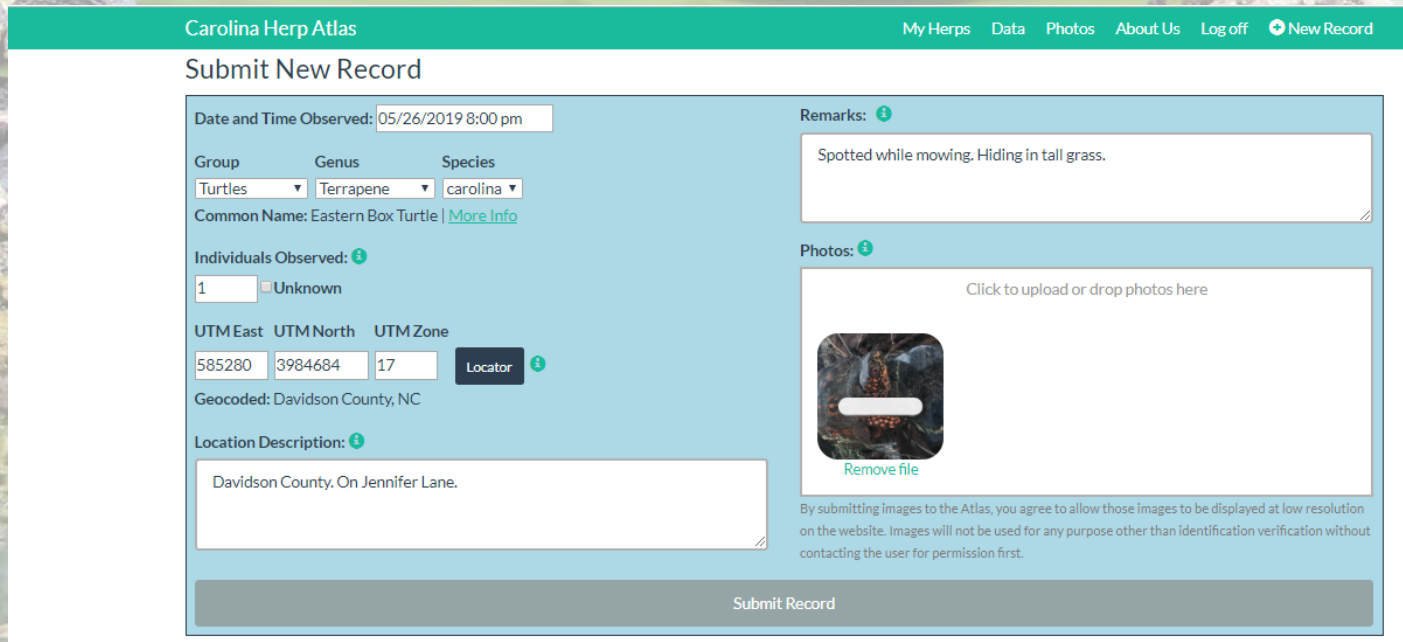
NORTH CAROLINA
Museum of Natural Sciences

Neighborhood Box Turtle Watch





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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Citizen Science

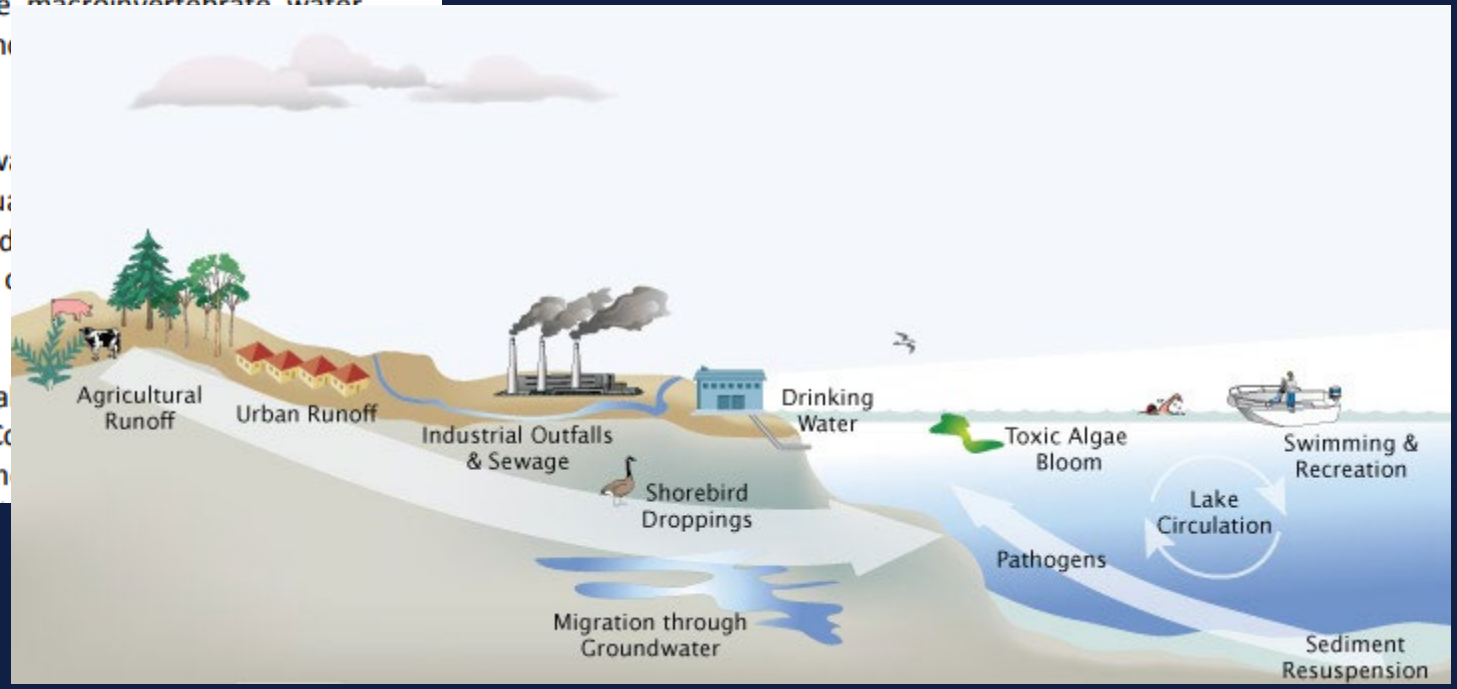
Water Monitoring Equipment

Resources

There are several different types of water monitoring and sampling equipment that have been used in citizen science work. All equipment is specific to the type of data being collected, i.e. macroinvertebrate, water quality parameters, pathogens, etc. A few examples of common citizen scien below:

Multiparameter Sonde – Multiparameter sondes are rugged, customizable w house sensors for surface water monitoring. Sensors are purchased individu The most common sensors measure temperature, pH, dissolved oxygen, cond others can be purchased as well. These instruments can be used in a variety real-time data.

Bacteriological Monitors – There are several different types of bacteriologica testing of bacteria, which is generally a good indicator of human pollution. C include total coliforms, fecal coliforms, *e.coli,* and *enterococci*. Though the m



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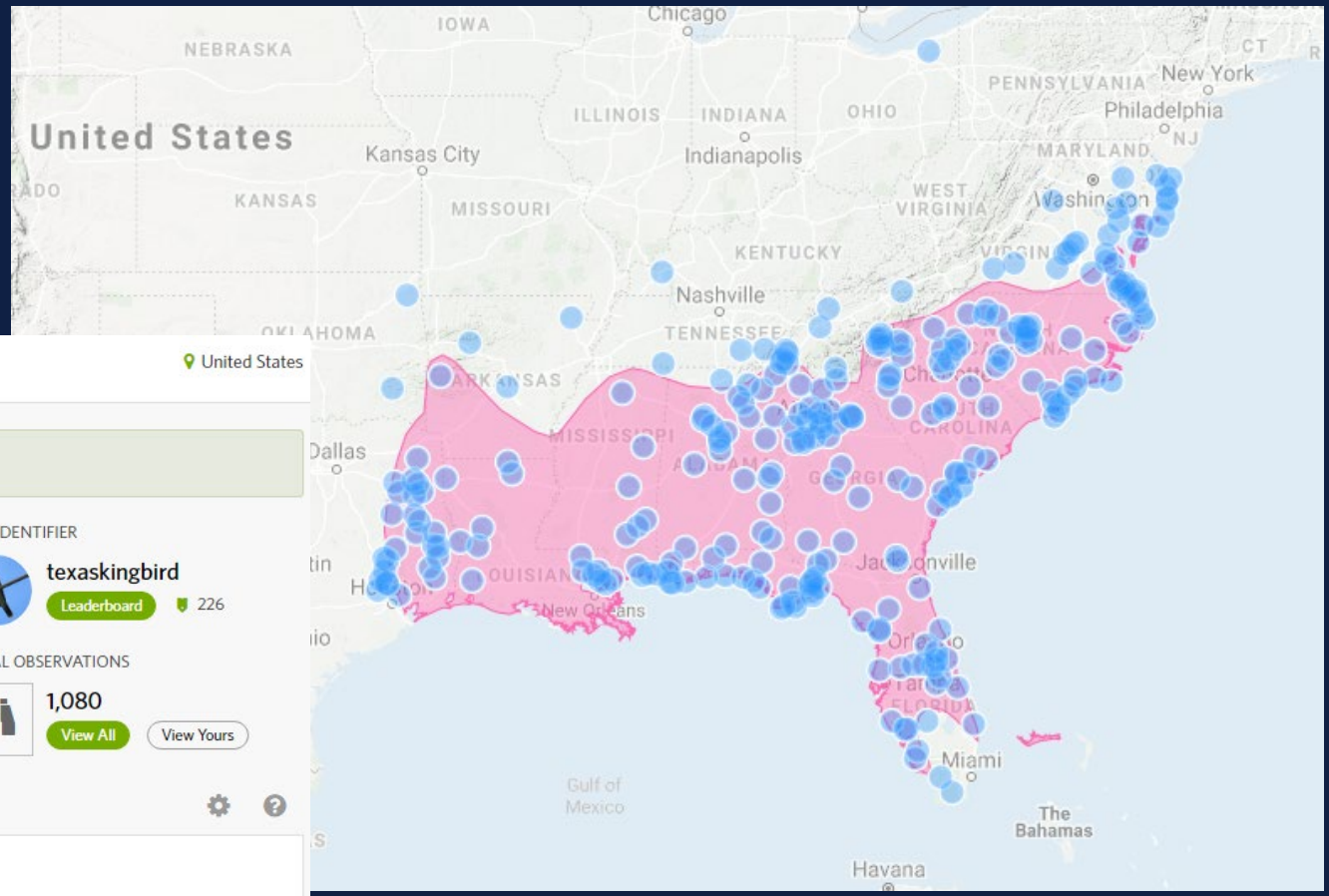
Using Secondary Data

- Save time by using researchers data
- Government data
- Data repositories
- Expand skills beyond traditional information sources

iNaturalist Data



Brown-headed Nuthatch (*Sitta pusilla*)

United States

Native to United States (Source List: United States Check List)

TOP OBSERVER

kkeivit

Leaderboard 343

TOP IDENTIFIER

texaskingbird

Leaderboard 226

LAST OBSERVATION

August 04, 2019

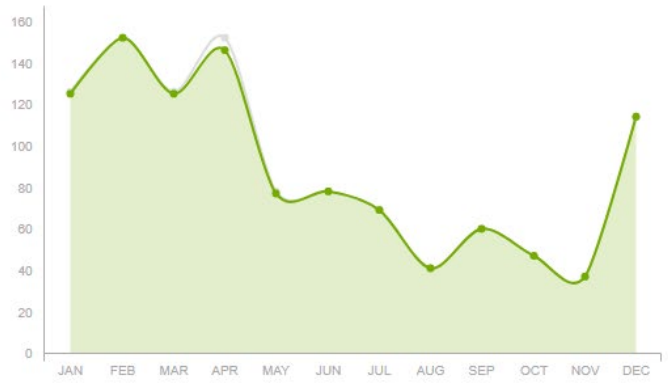
View Observation

TOTAL OBSERVATIONS

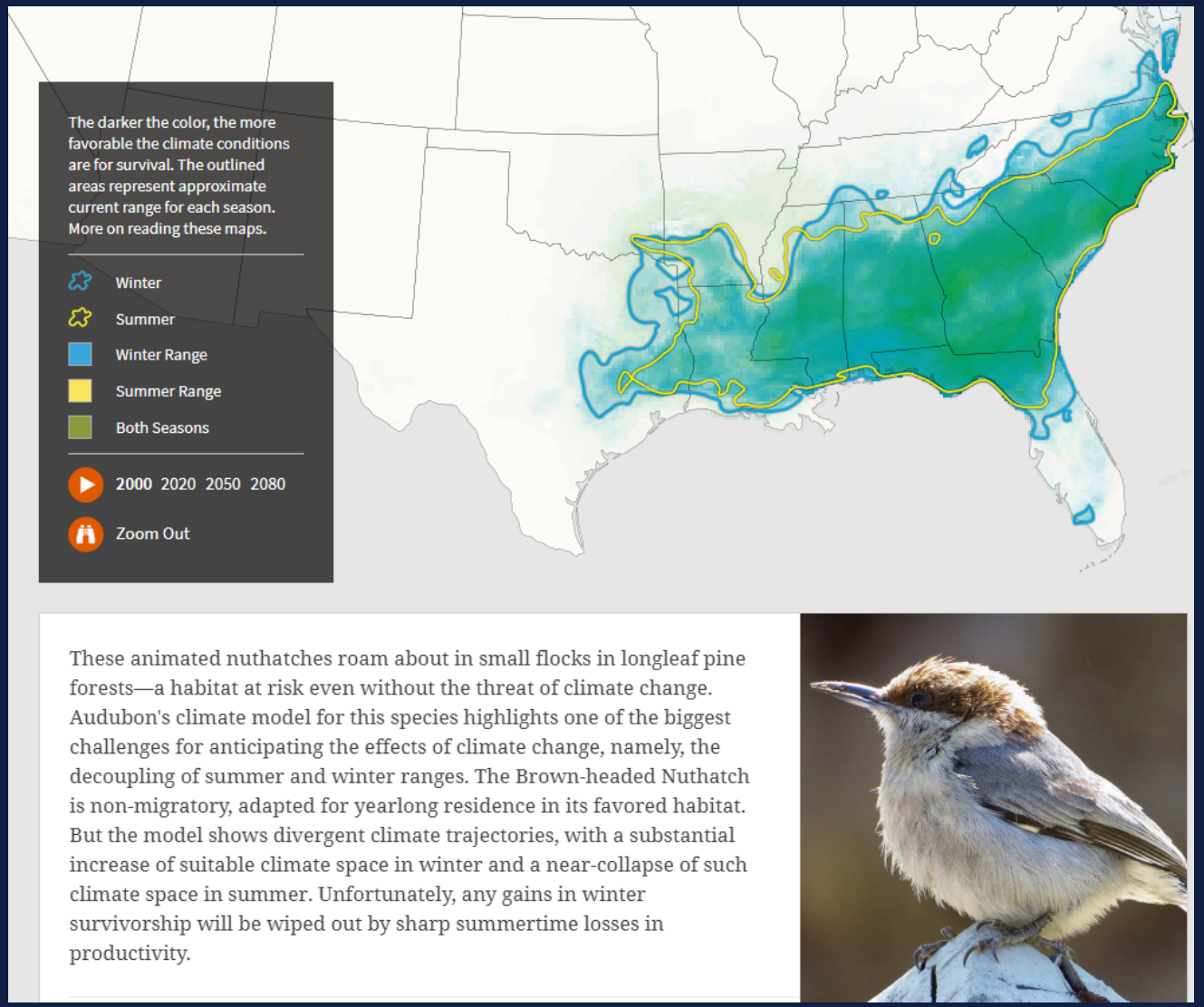
1,080

View All View Yours

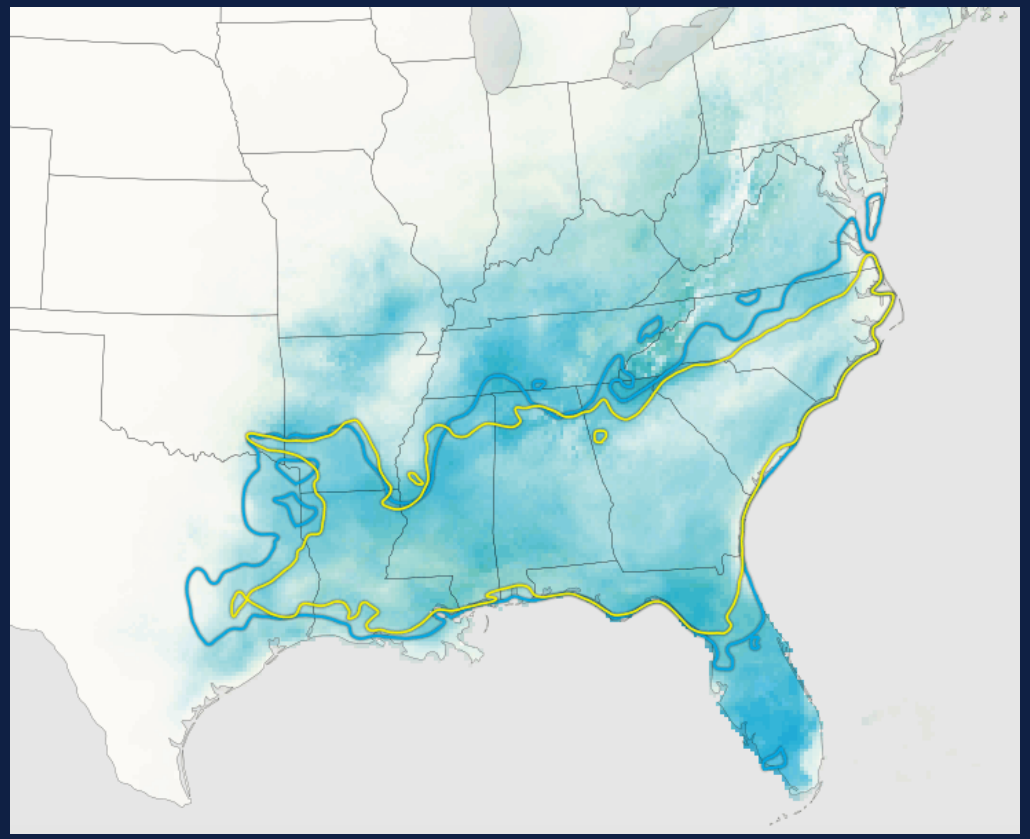
Seasonality History Life Stage



Audubon Birds and Climate Report

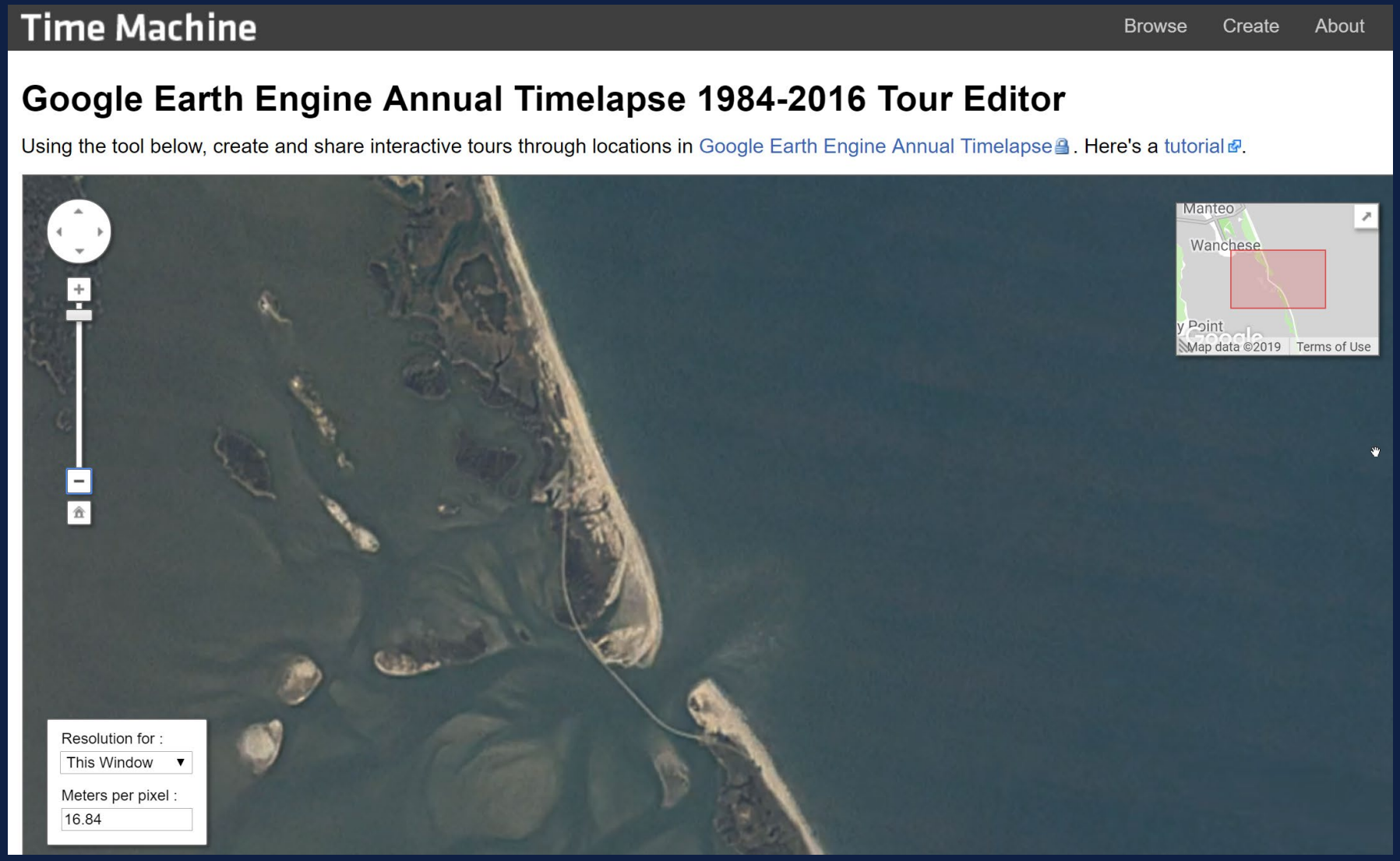


These animated nuthatches roam about in small flocks in longleaf pine forests—a habitat at risk even without the threat of climate change. Audubon's climate model for this species highlights one of the biggest challenges for anticipating the effects of climate change, namely, the decoupling of summer and winter ranges. The Brown-headed Nuthatch is non-migratory, adapted for yearlong residence in its favored habitat. But the model shows divergent climate trajectories, with a substantial increase of suitable climate space in winter and a near-collapse of such climate space in summer. Unfortunately, any gains in winter survivorship will be wiped out by sharp summertime losses in productivity.



Images from the Audubon climate report

NC Coastal Changes



Air Quality Curriculum

MODULE 1 - AIR POLLUTANTS AND THEIR SOURCES

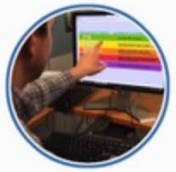
− MODULE 1 SUMMARY

7 activities and 4 videos covering the basic science of air quality including: properties of air, combustion, the criteria pollutants, local & regional pollution data, and detecting ozone and particulate matter.

+ 1-1 WHAT IS AIR?

+ 1-2 COMBUSTION & COMBUSTION EQUATIONS

+ 1-3 PARTS PER MILLION



MODULE 2 - PREDICTING AIR POLLUTION

− MODULE 2 SUMMARY

3 activities and 1 video exploring the science of predicting air pollution including: the air quality index, developing a model to predict ground-level ozone, and air quality monitoring forecasting.

+ 2-1 WHAT'S AN AIR QUALITY INDEX?

+ 2-2 MAKING A SIMPLE PREDICTIVE MODEL FOR GROUND-LEVEL OZONE POLLUTION

+ 2-3 FORECASTING AIR QUALITY

MODULE 3 - AIR POLLUTION PROBLEMS AND SOLUTIONS

− MODULE 3 SUMMARY

5 activities and 4 videos introducing possible solutions to our air quality problems including: scientific research, personal energy and driving choices, technology solutions, energy efficiency, alternative energy, regulations.

+ 3-1 SCIENTIFIC LITERACY AND AIR QUALITY

+ 3-2 INTRODUCTION TO SOLUTIONS & HOME ENERGY CHOICES

+ 3-3 DRIVING CHOICES & CALCULATING CAR

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Resources

Platforms

- Citizenscience.gov
- Zooniverse.org
- inaturalist.org

More Resources

http://go.uncg.edu/k12stemresources